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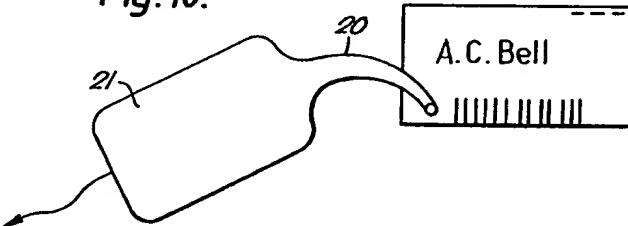
England.

(54) Digital transmission for telephone use

(57) In a telephone subscriber's instrument, dialling of a wanted number uses a mark-sensing technique in which relative movement occurs between the wanted number represented in bar code form and a sensor.

In a preferred form, the sensing is effected by moving a hand-held probe (20) across the bar code on a card, or telephone directory entry or other printed record. The code as read by the probe (20) is converted to electrical form by circuitry in a box (21) associated with the probe.

Fig. 10.

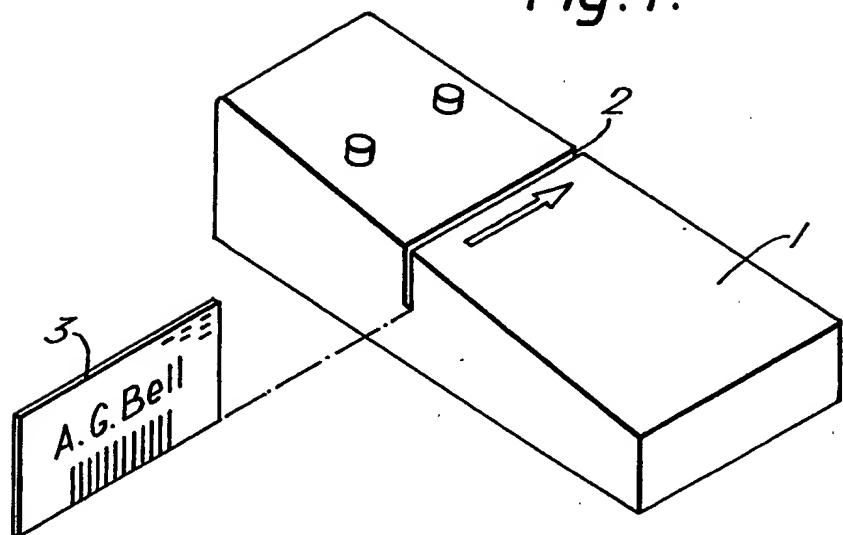


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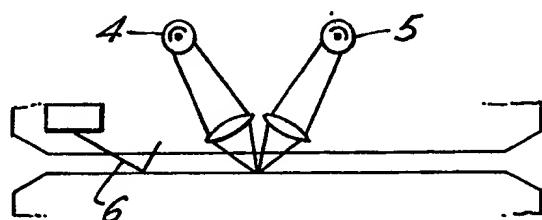
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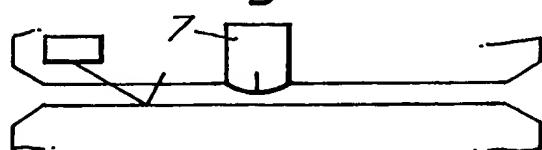
*Fig. 1.*



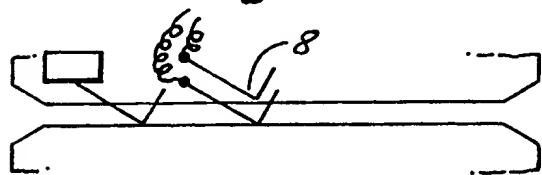
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



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Fig. 5.

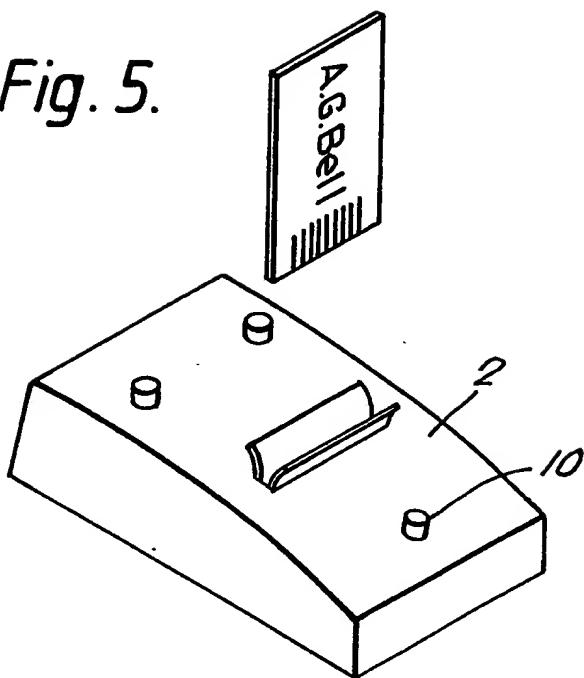


Fig. 6.

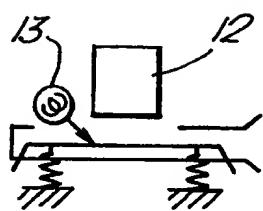


Fig. 7.

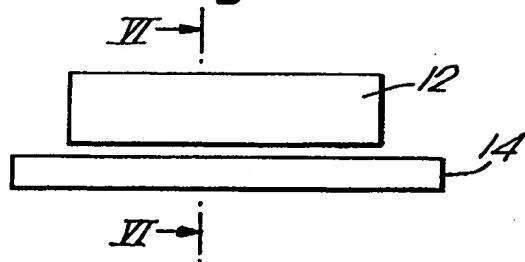


Fig. 8.

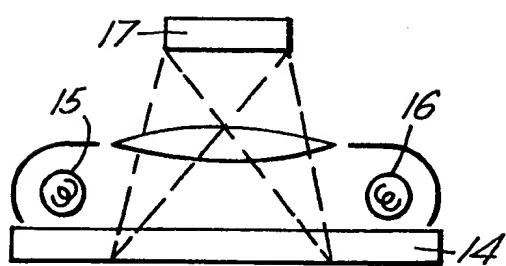
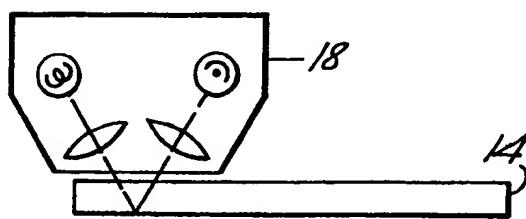


Fig. 9.



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Fig. 10.

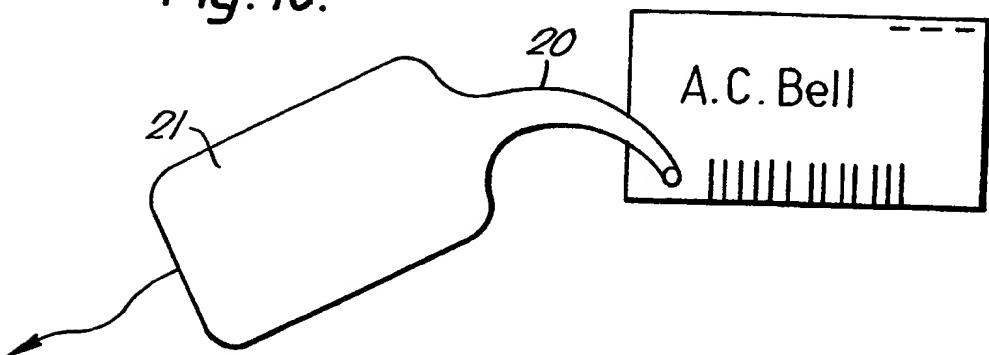


Fig. 11.

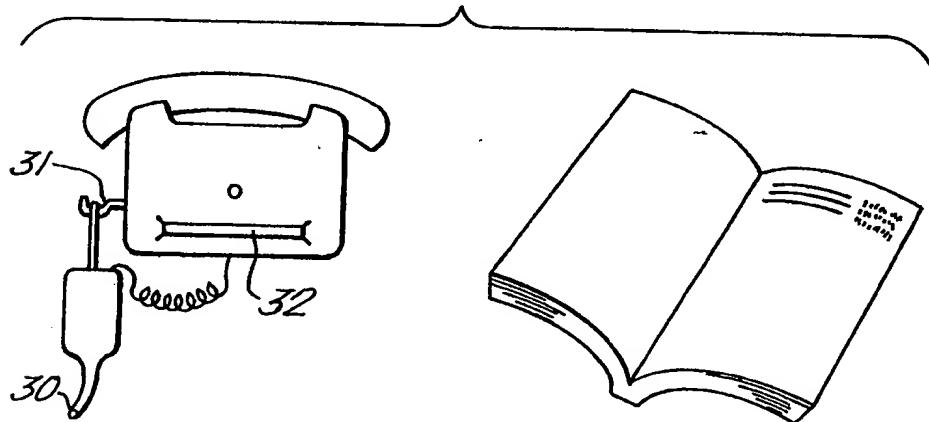
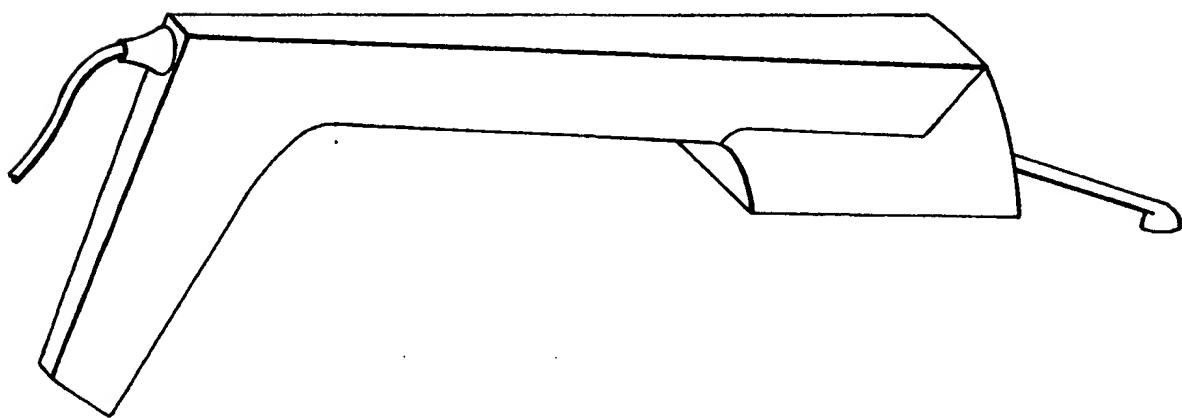


Fig. 12.



## SPECIFICATION

### Digital transmission for telephone use

5 This invention relates to methods of, and apparatus for, the transmission of wanted-number digits from a telephone subscriber's instrument.

Such digit transmission is usually known as dialling in spite of the fact that many telephone 10 instruments now in use employ push-button sets for the digits transmission. Dials and push-button sets are relatively complex mechanisms, and it is an object of this invention to provide a similar and more economical method of digit sending than that used 15 hitherto.

According to the invention there is provided a method of transmitting a wanted number from a telephone subscribers's instrument or the like, in which the number is printed or otherwise represented 20 in a mark-space coded form on a suitable surface, and in which to transmit the number relative movement is produced between the coded representation of the number and a sensing device, such that the sensing device senses the mark-spaced coded representations and derives therefrom an electrical 25 output which forms the wanted number output of the instrument.

The coded representations mentioned above are printed telephone directories in association with the 30 name and address entries, probably immediately adjacent to the printed telephone number. In addition the coding can be printed on headed notepaper, in advertisements in the press, and along the edge of a card such as a visiting card. In the latter case, as 35 will be seen below, the card is fitted into a slot in the body of a telephone instrument and moved laterally along the slot.

Embodiments of the invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 shows schematically an embodiment of the invention in which a card bearing the wanted number in coded form is moved along a slot in the telephone instrument body.

Figures 2, 3 and 4 show schematically three mark sensing techniques for use in the arrangement of Figure 1.

Figure 5 is an alternative arrangement to that of Figure 1 for sensing a number coded along a card.

Figures 6, 7 & 8 represent various sensing techniques usable with the arrangement of Figure 5.

Figure 10 shows an embodiment of the invention in which the mark sensing uses a hand-held probe.

Figure 11 shows schematically how the embodiment of the invention shown in Figure 10 may be applied in a telephone call box.

Figure 12 shows how a probe for use in an arrangement such as that shown in Figure 10 may be incorporated into a telephone handset.

In Figure 1, there is a telephone instrument body 1 housing a slot 2 into which a card 3 is fitted when a number is to be "dialed". This case bears a coded representation, in mark-space form - of the number to which the card relates along its lower edge. This 65 card is fitted into the left-hand end of the slot after

the caller hears dial tone, and then moved along the slot in the direction of the arrow on the instrument body 1. This arrow is printed on the upper surface of the body 1, as guidance for the subscriber. As the

70 card moves along the slot, the coded number on its lower edge is read off by the sensing means, so that it can be sent to the exchange, for instance by "Strowger-type" impulsive a voice frequency.

One form of sensing device is shown in Figure 2:

75 here we have a lamp 4 from which light is directed on to the path of the card via a lens, reflected light being directed by another lens on to a photo-cell 5. At the end of the slot there is a start-stop switch 6, which is switched on by the front edge of the card as 80 it is fitted in and switched off by the rear edge of the card towards the end of its travel along the slot.

In Figure 3, the sensing device is a magnetic read head, the coded representations of the number using ferro-magnetic strips. In the arrangement of

85 Figure 4, the marks on the card are of electrically conductive material, and sensing uses a pair of contacts 8 which bear on the card as it traverses the slot. For each conductive strip sensed, current flows between the two contacts 8.

90 In the above arrangements, the slot may be provided with ratchet rollers or ratchet-type surfaces to prevent movement of the card backwards.

In the arrangement of Figure 5, the card has its coded on one of the shorter edges, and after it has 95 been fitted into the slot 2 a send button 10 is depressed, which causes sensing means to scan along the card edge and thus read off the number. It will be appreciated that operationally this is the inverse of the arrangement of Figure 1.

100 Various scanning arrangements can be used: thus in Figures 6 and 7, where Figure 6 is a section along the line VI-VI of Figure 7, the detection uses a charge coupled device arrangement 12, with a lamp 13 whose light output is "aimed" at the card while in 105 the slot 14. The scanning is effected by circuitry in the arrangement 12.

Figure 8 shows an arrangement in which there are two lamps 15 and 16, each with its own reflector, and a charge coupled device circuit 17 on which light 110 reflected from the card in the slot 14 is received.

Figure 9 uses a mechanically movable optical scanning head 18.

Another method of reading the code combinations uses a hand-held probe, see Figure 10. Here the

115 probe 20 is wiped along or closely adjacent to the coded representation of the number. Reading can use optical techniques with the associated circuitry in the probe's box 21. Such a device can be used to read cards such as used in the arrangements of

120 Figures 1 and 5, and also coded representations in telephone directories or included in a company or person's headed notepaper, or in advertisements. Such a probe could read the code optically, electrically or magnetically.

125 Figure 11 shows schematically an arrangement for a public call box using the probe technique. Here we have a probe 30 with its box hanging from a hook 31 on the telephone casing. At the back of this instrument there is a slot 32 for reception of a credit card.

130 As shown, the telephone directories can include,

alongside each number its coded equivalent. Reading via the probe enables the user, if so desired to ignore part of the noted number, e.g. the 01 prefix for a local call when dialled within the London

5 telephone region. A telephone directory is shown at the right-hand side of Figure 11, with the coded representation shown at the right hand end of each subscriber's line on the page.

Such a probe could be incorporated into the

10 handset, as shown in Figure 12. It could be retractable and operable like a flick knife, or hingeable like a penknife blade. The handset in such an arrangement is held in the usual way until dial tone is heard, when the probe is wiped across the bar code, after which 15 the handset is returned to the ear. Such a handset could be so designed as to have an end suitably-shaped to contain a fixed probe at its end.

For optical reading of the coded representation the lamp used should be of the low current type to

20 minimise drain on the line current. A light-emitting diode is a good choice if it provides enough light.

Several methods could be used to print the coding, for instance:

a) optically-read black and white bars, e.g. with 25 different spacing and/or thickness, which could be printed by a special typewriter head.

b) Magnetically-read bars, printed, as in (a), above.

c) Magnetically-read magnetic recording on the 30 page, preferably invisible or appearing as a colour wash over the printed name and address.

d) Magnetically printed figures such as CMC7 or E13B characters as used on cheques. These may need to be reduced in size without impairment of 35 efficiency.

e) Optically read printed figures, i.e. the telephone number as now printed.

f) Optically read coloured bars over each printed address.

40 With telephone directories, especially in the London area, resistance may be encountered to increasing the space allocated to each entry. Thus alternative (f) may be used, with, for instance, a yellow bar code which would not impede reading of the

45 address by the eye, but is easily readable by a probe sensitive only to yellow marks.

Other convenient places for bar coding are:

i) in all advertisements in newspapers and journals in which an instant call is invited.

50 ii) on the telephone itself for emergency numbers such as 999.

iii) on a special pad by the telephone.

iv) on notepaper and billheads.

We have referred above to circuitry needed to

55 convert the codes read by the sensing device into signals for transmission to a telephone exchange. Such circuitry includes a store into which the bar code signals read by the sensing device are placed plus conversion circuits to convert the stored signals

60 digit-by-digit into either break impulses or voice frequency signals for transmission to the exchange. Where the conversion is to break impulses such as used in "Strowger-type" exchanges the circuitry can, for instance, follow the principles of our Patent

65 No. 1,369,829 (M.J. Debenham-1) or of our Patent

No. 1,395,577 (A.N. Lawson-C.M. Tabalba 10-5).

## CLAIMS

- 70 1. A method of transmitting a wanted number from a telephone subscriber's instrument or the like, in which the number is printed or otherwise represented in a mark-space coded form on a suitable surface, and in which to transmit the number relative movement is produced between the coded representation of the number and a sensing device, such that the sensing device senses the mark-spaced coded representations and derives therefrom an electrical output which forms the wanted number output of the instrument.
- 75 2. A method as claimed in claim 1, in which the number is represented along the edge of a card or the like which is moved manually through a slot in the instrument body, the card being progressed past the sensing device.
- 80 3. A method as claimed in claim 1, in which the number is represented along the edge of a card or the like, which is fitted into a slot in the instrument body, and in which the sensing device is then moved along the card or the like to effect said sensing.
- 85 4. A method as claimed in claim 1, 2 or 3 and in which the sensing device is an optical sensor.
- 90 5. A method as claimed in claim 2 or 3, and in which the sensing device is a magnetic sensor.
- 95 6. A method as claimed in claim 2 or 3, in which the coded representations are electrically conductive strips on the card, and in which the sensing device includes a pair of contacts bearing on the card such that for each said strip an electrical connection is set up between the contacts via that strip.
- 100 7. A method as claimed in claim 1, and in which the sensing device is a hand-held probe which is traversed manually along the line of the coded representation.
- 105 8. A method as claimed in claim 7, in which the sensing device is an optical sensor.
9. A method as claimed in claim 7, in which the sensing device is a magnetic sensor.
- 110 10. A method as claimed in claim 7, 8 or 9, and in which the probe is integral with or carried by the telephone handset.
- 111 11. Apparatus for performing the method of any one of claims 1 to 10.
- 115 New claims or amendments to claims filed on 27 Oct. 1980.
- 120 New or amended claims:-
- 125 12. A hand-held probe for transmitting electrical signals representative of a wanted subscriber's number from a telephone subscriber's instrument, which probe includes a sensing device such that when the probe is traversed across a mark-space coded representation of the wanted number printed or otherwise produced on a suitable surface electrical signals representative of the wanted number are produced by the sensing device, and electrical circuitry in the probe and associated with the sensor,
- 130

which circuitry derives from the output of the sensor electrical signals representative of the wanted number for transmission from the instrument.

13. A probe as claimed in claim 12, and which is 5 an item separate from a telephone instrument's handset but which is connected to the instrument by a cable.

14. A probe as claimed in claim 12, and which is part of the telephone instrument's handset.

10 15. A probe as claimed in claim 14, and which probe is normally housed within the handset, but is extensible therefrom when a wanted number is to be transmitted.

16. A probe as claimed in claim 12, 13, 14 or 15, 15 and in which the sensing device is an optical sensor.

17. A probe as claimed in claim 12, 13, 14 or 15, and in which the sensing device is a magnetic sensor.

18. A method of transmitting a wanted number 20 from a telephone subscriber's instrument, in which the number is printed or other-wise represented in a mark-space coded form on a suitable surface, and in which to transmit the number a hand-held probe which contains a sensing device is traversed across 25 the said representation of the wanted number, whereby electrical signals representative of the wanted number are produced by the sensing device, and in which electrical circuitry in the probe and associated with the sensing device responds to the 30 result of the sensing of the mark-space coded representation and derives therefrom an electrical output which forms the wanted number output of the instrument.